HP ProLiant DL360 Generation 4 Server Maintenance and Service Guide

September 2004 (Second Edition)
Part Number 373553-002

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Audience Assumptions

This guide is for an experienced service technician. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels and are familiar with weight and stability precautions for rack installations.

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Illustrated Parts Catalog

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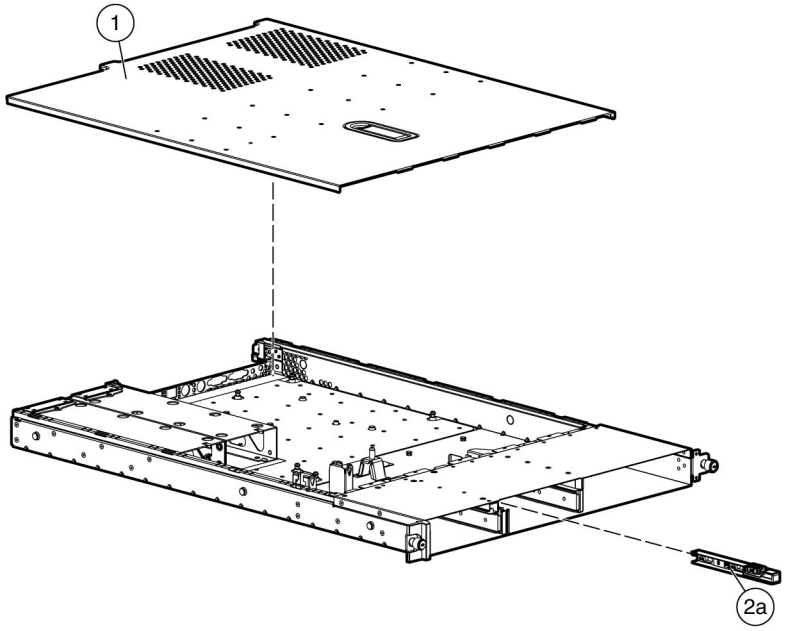
Mechanical Components

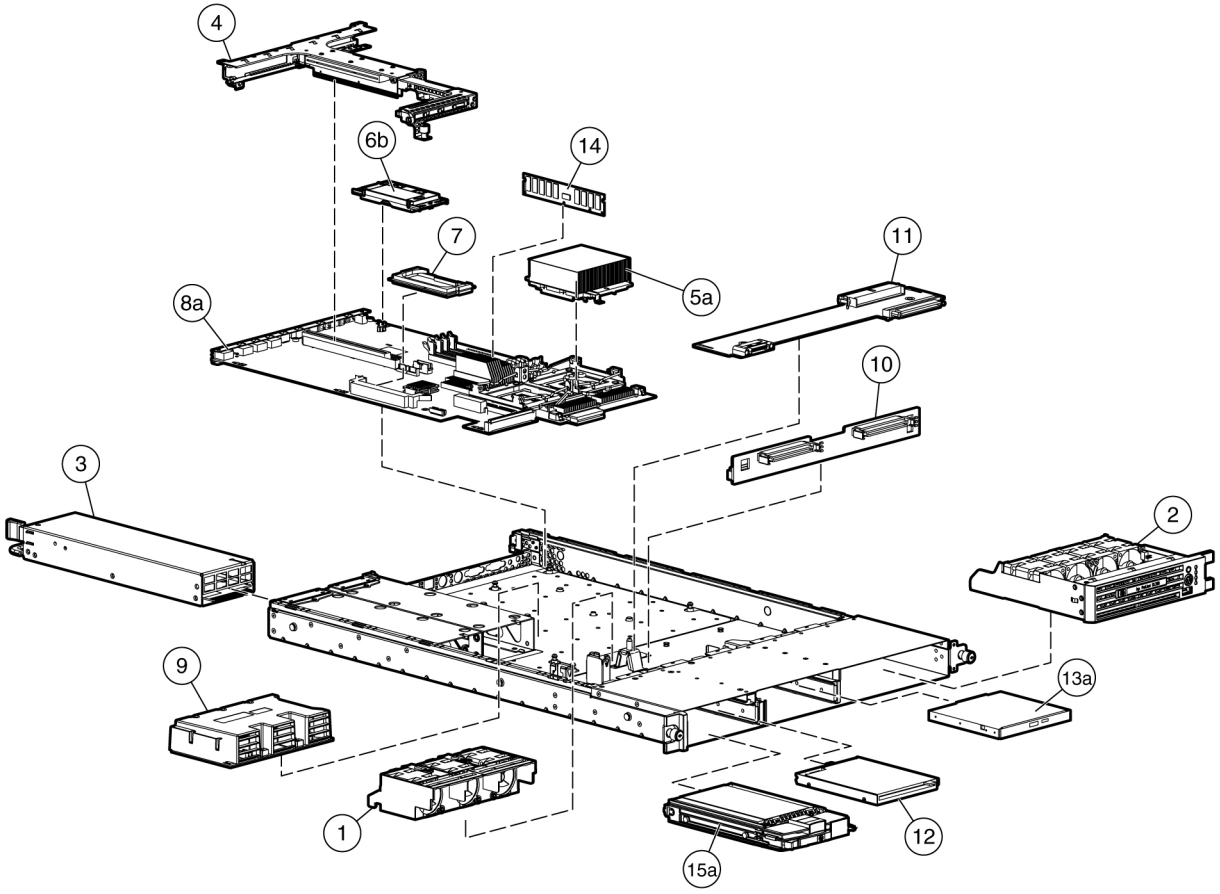


Item	Description	Spare Part Number
1	Access panel	361400-001

Item	Description	Spare Part Number
2	Plastics kit	361396-001
	a) Optical drive ejector assembly	30545-001
	b) PCI card guide *	
	c) Diskette blank *	
	d) Optical device blank *	
3	Hardware kit	361397-001
	a) Screws, 6-32X0.25, T10 (4) *	
	b) Screw, 6-32X.187, T15 (4) *	
	c) Screw, M3X0.5X4, T10 (4) *	
	d) Expansion slot covers (2) *	
	e) Power supply blanking panel *	
	Rack Mounting Hardware	
5	Rack mounting hardware kit *	360104-001
6	Cable management arm *	360105-001

*Not shown

System Components



Item	Description	Spare Part Number
	System Components	
1	Power supply fan assembly	361399-001
2	Processor fan assembly	361390-001
3	Hot-plug power supply, 460 W	361392-001
4	PCI riser bracket, with PCI riser boards	361387-001

Item	Description	Spare Part Number
5	Processor/heatsink assembly	
	a) Intel® 3.00-GHz Xeon™ 1-MB L2 cache	371751-001
	b) Intel® 3.40-GHz Xeon™ 1-MB L2 cache *	361381-001
	c) Intel® 3.60-GHz Xeon™ 1-MB L2 cache *	361382-001
6	a) 3.6 volt, 500 mAh NiMh battery *	307132-001
	b) Universal battery housing with cable	349989-001
7	Smart Array 6i 128MB DDR 40 bit memory module	351518-001
	Boards	
8	System board, with processor cages and system battery	
	a) SCSI models	361384-001
	b) SATA models *	361385-001
9	Power converter module	361393-001
10	SCSI backplane	305443-001
	SATA backplane with data and power cables *	361389-001
11	Optical device/diskette drive interface	361395-001
	Media Devices	
12	Diskette drive, slimline, 1.44 MB	361402-001
13	Optical drives	
	a) CD-ROM drive, removable slimline, IDE, 24X	228508-001
	b) DVD-ROM drive, removable slimline, 8X *	268795-001
	Memory	
14	DIMM, registered DDR SDRAM	
	a) 512 MB	366865-001
	b) 1 GB *	367167-001
	c) 2 GB *	367553-001
	Hard drives	

Item	Description	Spare Part Number
15	SCSI Ultra320 universal hot-plug hard drive	
	a) 36.4-GB 15K rpm	289241-001
	b) 72.8-GB 10K rpm *	289042-001
	c) 72.8-GB 15K rpm *	289243-001
	d) 146.8-GB 10K rpm *	289044-001
16	SATA hot-plug hard drive	
	a) 80-GB 7.2K rpm *	353042-001
	b) 160-GB 7.2K rpm *	353043-001
	c) 250-GB 7.2K rpm *	353044-001
	Cables	
17	Diskette drive/optical drive cable *	361391-001
	Miscellaneous	
18	AC power cord *	187335-001
19	Battery, 3.3 V, lithium *	234556-001
20	Country kit *	361401-001
21	Return kit, pack box, and cushions *	371695-001

*Not shown

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Required Tools

You need the following items for some procedures:

- T-10 Torx screwdriver

- T-15 Torx screwdriver
- Diagnostics Utility

Safety Considerations

Before performing service procedures, review all the safety information.

Preventing Electrostatic Discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Server Warnings and Cautions

Before installing a server, be sure that you understand the following warnings and cautions.

WARNING: To reduce the risk of electric shock or damage to the equipment:

- **Do not disable the power cord grounding plug. The grounding plug is an important safety feature.**
- **Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.**
- **Unplug the power cord from the power supply to disconnect power to the equipment.**
- **Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the server.**

WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

CAUTION: Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

Preparation Procedures

To access some components and perform certain service procedures, you must perform one or more of the following procedures:

- Extend the server from the rack ("Extending the Server from the Rack" on page 17).

  If you are performing service procedures in an HP, Compaq branded, telco, or third-party rack cabinet, you can use the locking feature of the rack rails to support the server and gain access to internal components.

  For more information about telco rack solutions, refer to the RackSolutions.com website (http://www.racksolutions.com/hp).

- Power down the server ("Powering Down the Server" on page 16).

If you must remove a server from a rack or a non-hot-plug component from a server, power down the server.

- Remove the server from the rack.

  If the rack environment, cabling configuration, or the server location in the rack creates awkward conditions, remove the server from the rack.

Powering Down the Server

WARNING: To reduce the risk of personal injury, electric shock, or damage to the equipment, remove the power cord to remove power from the server. The front panel Power On/Standby button does not completely shut off system power. Portions of the power supply and some internal circuitry remain active until AC power is removed.

IMPORTANT: If installing a hot-plug device, it is not necessary to power down the server.

1. Back up the server data.
2. Shut down the operating system as directed by the operating system documentation.
3. If the server is installed in a rack, press the UID LED button on the front panel. Blue LEDs illuminate on the front and rear panels of the server.
4. Press the Power On/Standby button to place the server in standby mode. When the server activates standby power mode, the system power LED changes to amber.
5. If the server is installed in a rack, locate the server by identifying the illuminated rear UID LED button.
6. Disconnect the power cords.

The system is now without power.

Extending the Server from the Rack

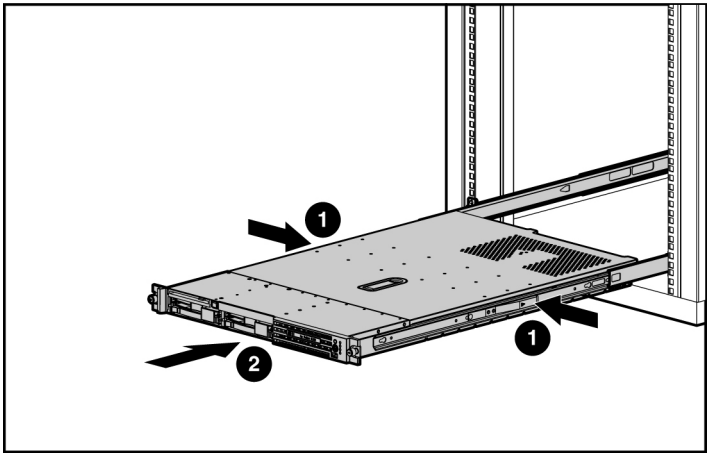
NOTE: If the optional cable management arm option is installed, you can extend the server without powering down the server or disconnecting peripheral cables and power cords. These steps are only necessary with the standard cable management solution.

1. Power down the server ("Powering Down the Server" on page 16).
2. Disconnect all peripheral cables and power cords from the server rear panel.
3. Loosen the thumbscrews that secure the server faceplate to the front of the rack.
4. Extend the server on the rack rails until the server rail-release latches engage.

WARNING: To reduce the risk of personal injury or equipment damage, be sure that the rack is adequately stabilized before extending a component from the rack.

WARNING: To reduce the risk of personal injury, be careful when pressing the server rail-release latches and sliding the server into the rack. The sliding rails could pinch your fingers.

5. After performing the installation or maintenance procedure, slide the server back into the rack:
   a. Press the server rail-release latches and slide the server fully into rack.



b. Secure the server by tightening the thumbscrews.

6. Reconnect the peripheral cables and power cords.

Removing the Access Panel

WARNING: To reduce the risk of personal injury from hot surfaces, allow the drives and the internal system components to cool before touching them.

CAUTION: Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

1. Power down the server if the standard cable management solution is installed ("Powering Down the Server" on page 16).

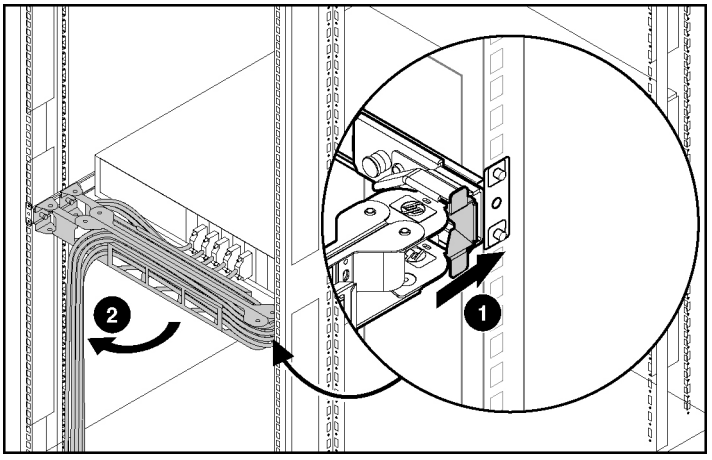
   NOTE: If the optional cable management arm is installed, you can extend the server and perform hot-plug installation or maintenance procedures without powering down the server.

2. Extend the server from the rack, if applicable ("Extending the Server from the Rack" on page 17).
3. Lift up on the hood latch handle and remove the access panel.

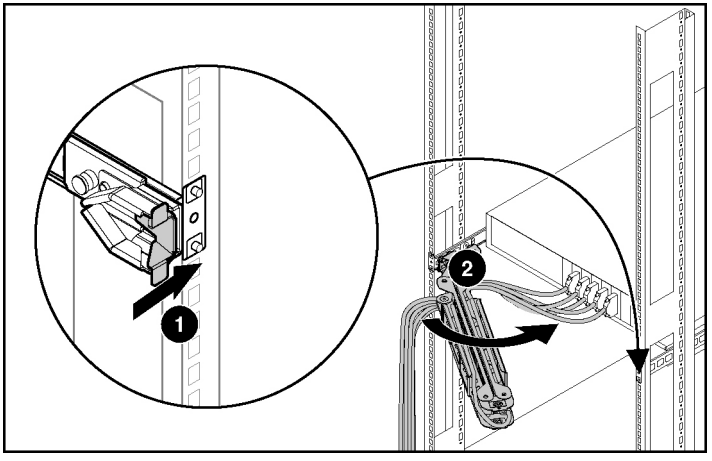
Accessing the Product Rear Panel

NOTE: To access some components, you may need to remove the cable management arm.

To open the arm:



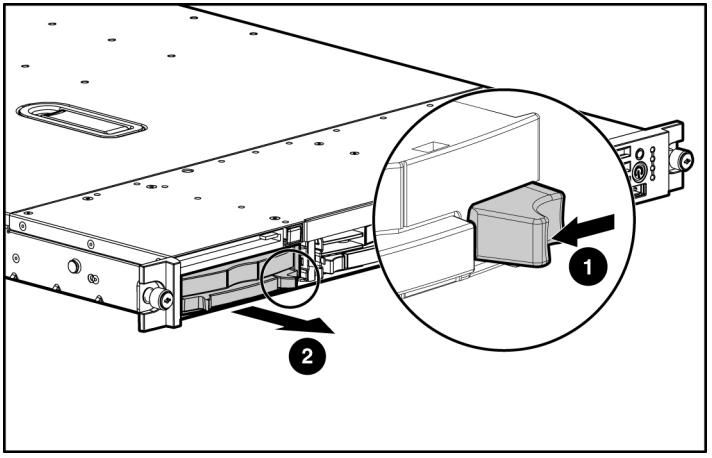
To close the arm:



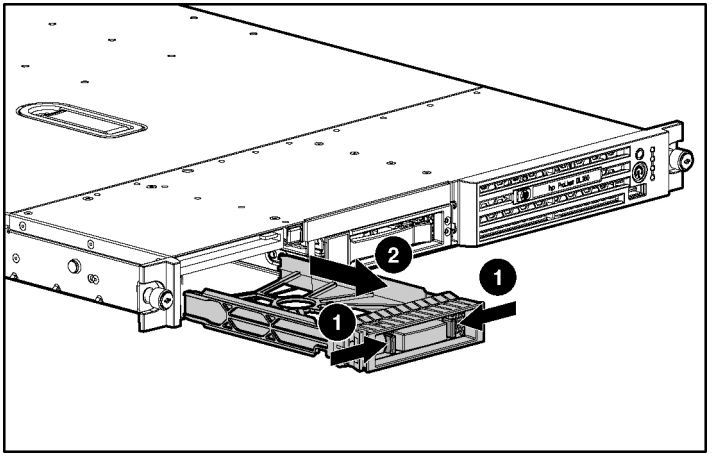
Hard Drive Blank

CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

1. Remove one of the following:
   - Remove the SCSI hard drive blank.



   - Remove the SATA hard drive blank.



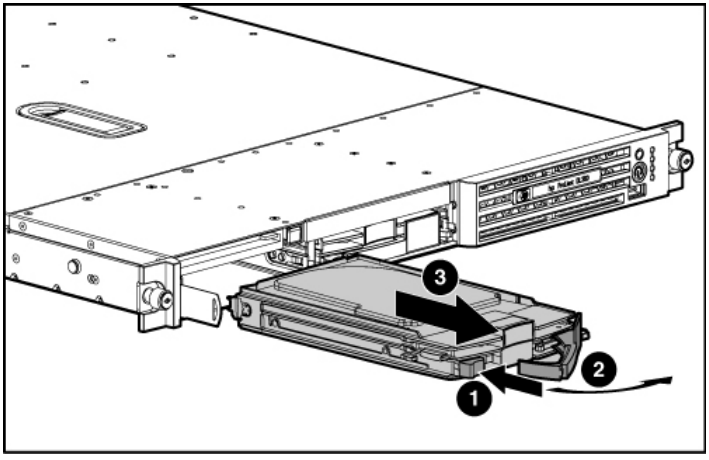
To replace the blank, slide the blank into the bay until it locks into place.

Hard Drive

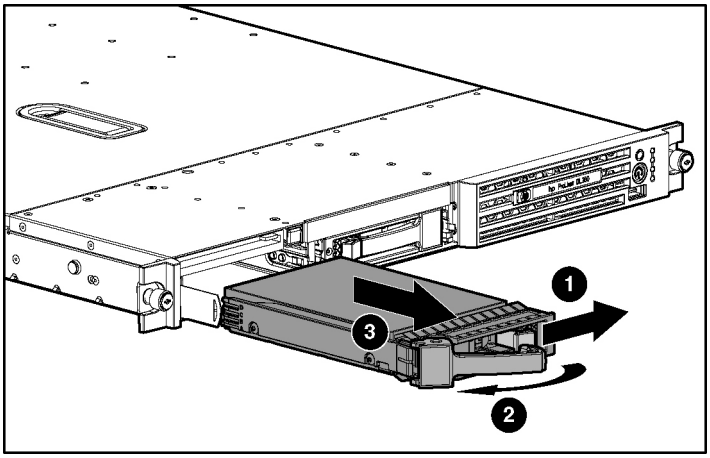
CAUTION: Always power down the server if the boot partition resides on the drive you are replacing or if you are replacing the only drive in the server.

CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

1. Determine the status of the hard drive from the hot-plug hard drive LEDs ("Hot-Plug SCSI Hard Drive LED Combinations" on page 74, "Hot-Plug SCSI Hard Drive LEDs" on page 73).
2. Back up all server data on the hard drive.
3. Remove one of the following:
   - Remove the SCSI hard drive.



– Remove the SATA hard drive.



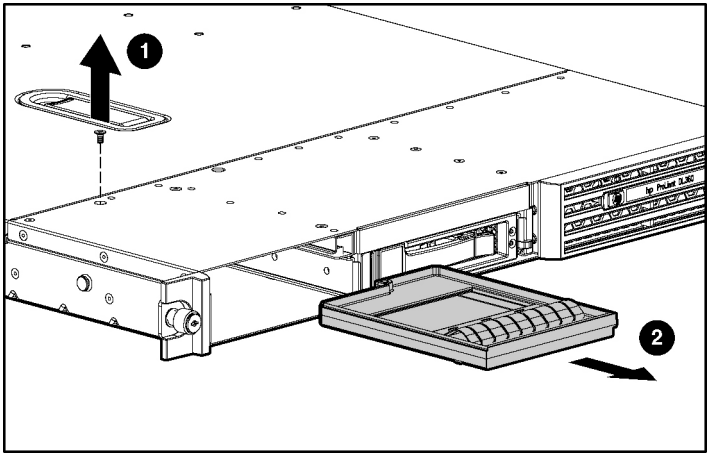
IMPORTANT: When SATA hard drives are installed, SATA LED functionality and SATA hot-plug capability are not supported currently.

To replace the drive, slide the drive into the bay until the latch mechanism engages the server chassis, then close the latch handle to lock the drive in the server chassis.

Diskette Drive Blank

1. Power down the server ("Powering Down the Server" on page 16).
2. Extend the server from the rack ("Extending the Server from the Rack" on page 17).
3. Remove one of the following from the left hard drive bay:
   – Hard drive blank (on page 19)
   – Hard drive (on page 21)
4. Use a Torx T-10 screwdriver to remove the locking screw.

5. Remove the diskette drive blank.

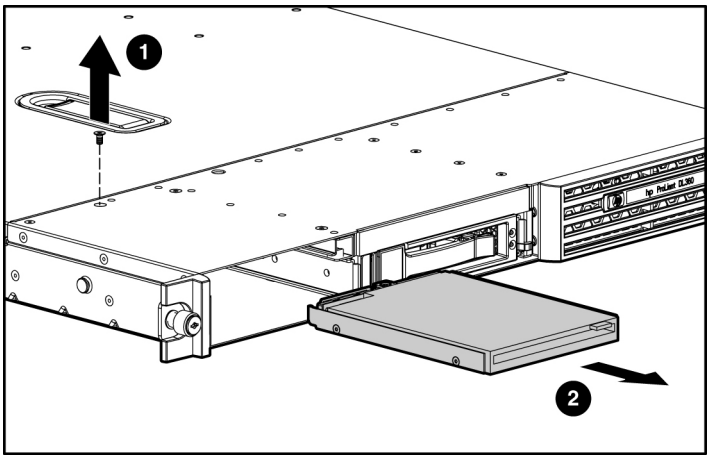


To replace the component, reverse the removal procedure.

Diskette Drive

1. Power down the server ("Powering Down the Server" on page 16).
2. Extend the server from the rack. ("Extending the Server from the Rack" on page 17)
3. Remove one of the following from the left hard drive bay:
   - Hard drive blank (on page 19)
   - Hard drive (on page 21)
4. Use a Torx T-10 screwdriver to remove the locking screw.

5. Remove the diskette drive.



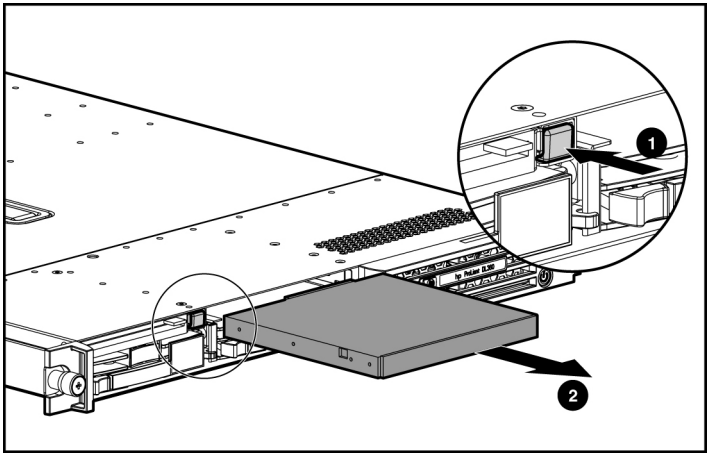
To replace the component, reverse the removal procedure.

Optical Device Blank

IMPORTANT: The ejector button is recessed to prevent accidental ejection; it may be helpful to use a pen or similar shaped object to access the button.

1. Press the ejector button.

2. Remove the optical device blank.



To replace the blank, slide the blank into the bay until it locks into place.

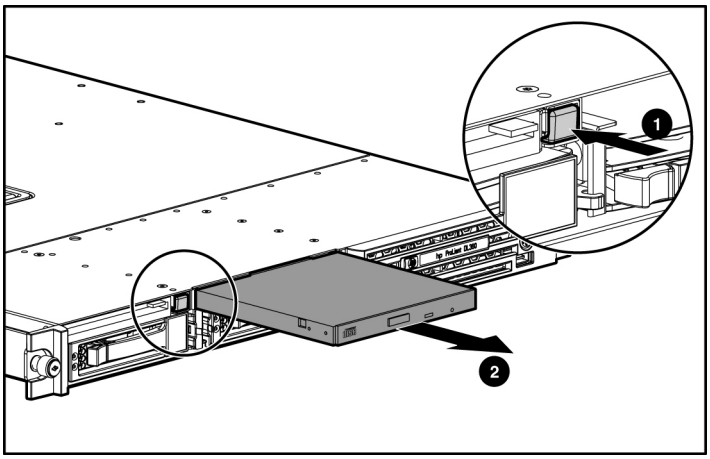
Optical Device

1. Power down the server ("Powering Down the Server" on page 16).

   IMPORTANT: The ejector button is recessed to prevent accidental ejection; it may be helpful to use a pen or similar shaped object to access the button.

2. Press the ejector button.

3. Remove the optical device.

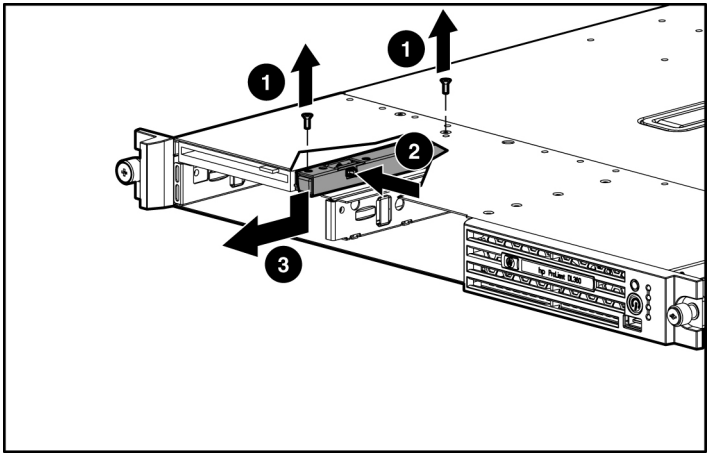


To replace the drive, slide the drive into the bay until it clicks.

Optical Device Ejector

1. Power down the server ("Powering Down the Server" on page 16).
2. Remove all hard drives ("Hard Drive" on page 21) and the hard drive blank (on page 19).
3. Eject the optical device (on page 25) or optical device blank (on page 24).
4. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
5. Remove the diskette drive ("Diskette Drive" on page 23).
6. Use a T-10 Torx screwdriver to remove the screws that secure the optical device ejector to the server chassis.
7. Press the tab on the side of the optical device ejector to release it from the chassis.

8. Remove the optical device ejector.



To replace the component, reverse the removal procedure.

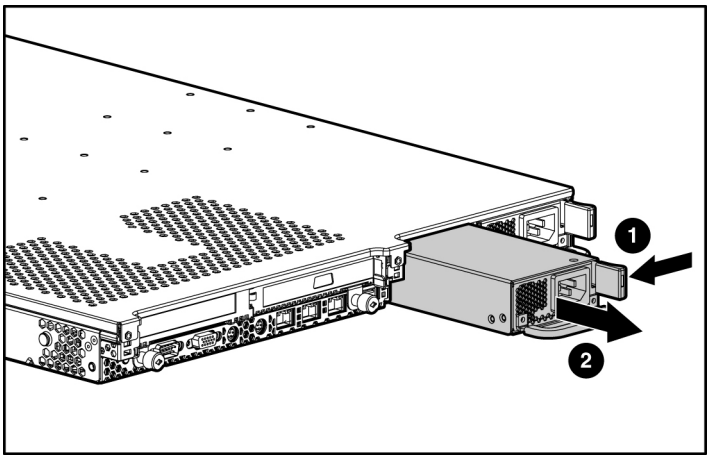
Hot-Plug AC Power Supply

This procedure assumes that the server is configured with two power supplies.

CAUTION: To prevent improper cooling and thermal damage, do not operate the server unless all bays are populated with either a component or a blank.

1. Perform one of the following:
   - If a conventional cable management solution is in place, unfasten the cable management solution to access the power supply bays.
   - If the cable management arm is in place, access the rear panel (on page 18).
2. Disconnect the power cord.

3. Press the power supply release lever, then pull the power supply from the server.



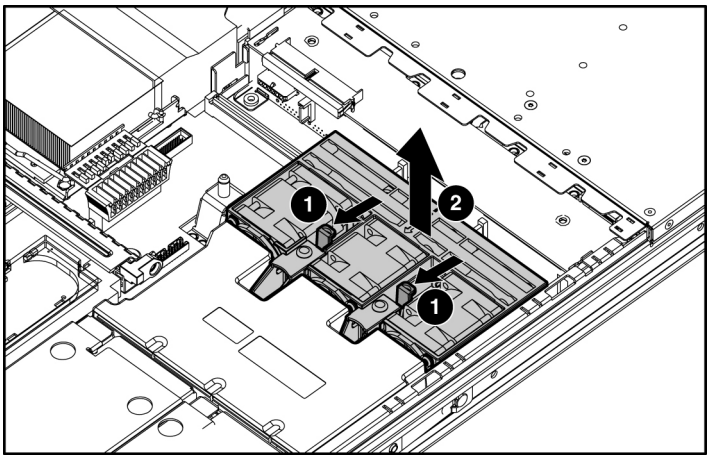
To replace the component, reverse the removal procedure.

Power Supply Fan Assembly

CAUTION: Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

1. Power down the server ("Powering Down the Server" on page 16).
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
3. Remove the access panel ("Removing the Access Panel" on page 18).
4. On models equipped with SATA drives, remove the SATA cable from the cable clip. For cable locations, refer to the SATA cable routing information ("SATA Cable Routing" on page 51).
5. Press the latches and lift to release the power supply fan assembly from the server.

6. Remove the component from the server.



CAUTION: When replacing the component, be sure the power converter module is properly seated in the server chassis.

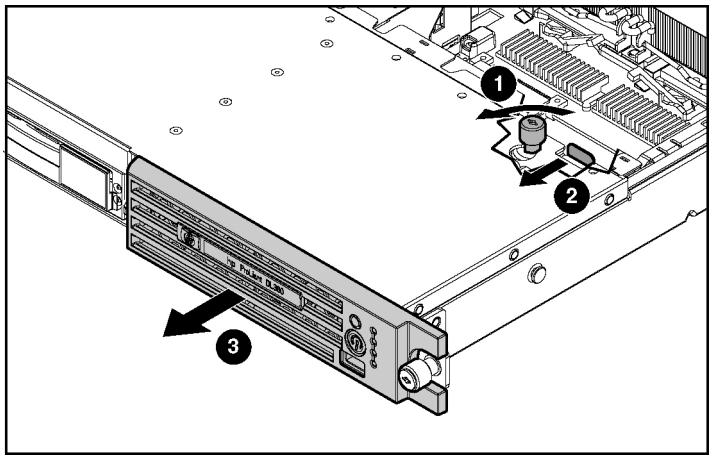
To replace the component, reverse the removal procedure.

Processor Fan Assembly

CAUTION: Do not operate the server for long periods without the access panel. Operating the server without the access panel results in improper airflow and improper cooling that can lead to thermal damage.

1. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
2. Remove the access panel ("Removing the Access Panel" on page 18).
3. Loosen the thumbscrew that secures the processor fan assembly to the server.
4. Push on the sheet metal tab near the thumbscrew to separate the fan tray connector from the system board connector.

5. Remove the component from the server.

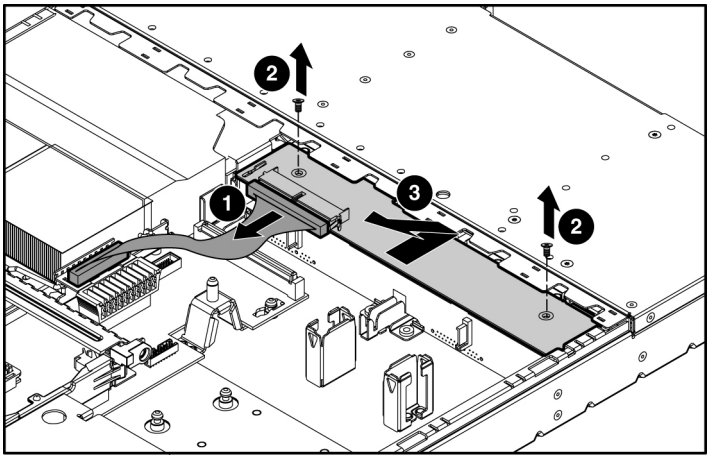


To replace the component, reverse the removal procedure.

Optical Device and Diskette Drive Interface

1. Power down the server ("Powering Down the Server" on page 16).
2. Remove all hard drives and hard drive blanks ("Hard Drive" on page 21).
3. Eject the optical device ("Optical Device" on page 25).
4. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
5. Remove the access panel ("Removing the Access Panel" on page 18).
6. Remove the diskette drive ("Diskette Drive" on page 23).
7. Disconnect the cable from the optical device and diskette drive interface board.
8. Use a T-15 Torx screwdriver to remove the two screws securing the board to the server chassis.

9. Slide the board toward the front edge of the server, lift up, then slide the board toward the rear of the server to remove the component.

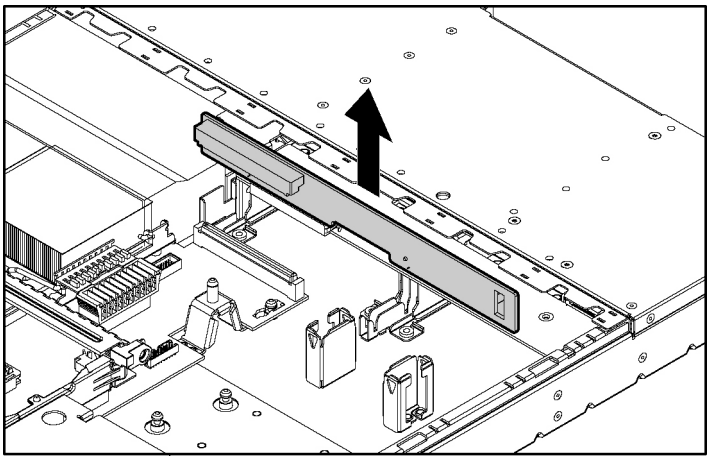


To replace the component, reverse the removal procedure.

SCSI Backplane

1. Power down the server ("Powering Down the Server" on page 16).
2. Remove all hot-plug SCSI hard drives ("Hard Drive" on page 21).
3. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
4. Remove the access panel ("Removing the Access Panel" on page 18).
5. Remove the power supply fan module ("Processor Fan Assembly" on page 29).
6. Disconnect the cable from the optical device and diskette drive interface board.

7. Remove the component from the server.

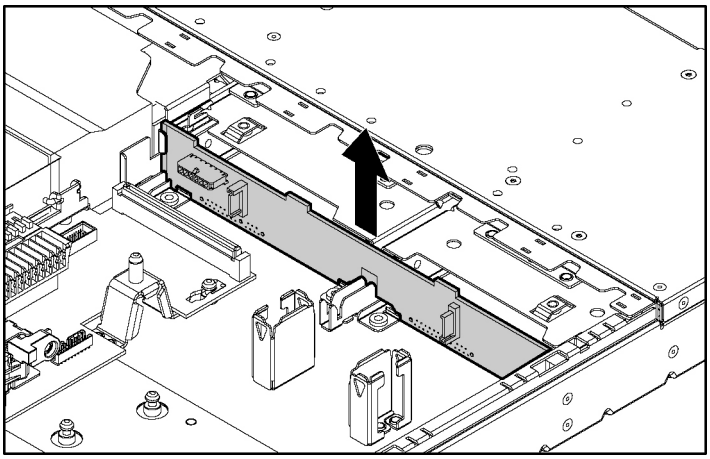


To replace the component, reverse the removal procedure.

SATA Backplane

1. Power down the server ("Powering Down the Server" on page 16).
2. Remove all SATA hard drives ("Hard Drive" on page 21).
3. Eject the optical device ("Optical Device" on page 25).
4. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
5. Remove the access panel ("Removing the Access Panel" on page 18).
6. Remove the optical device and diskette drive interface ("Optical Device and Diskette Drive Interface" on page 30).
7. Disconnect all cables connected to the SATA backplane. For cable locations, refer to the SATA cable routing (on page 51) information.

8. Remove the component from the server.



To replace the component, reverse the removal procedure.

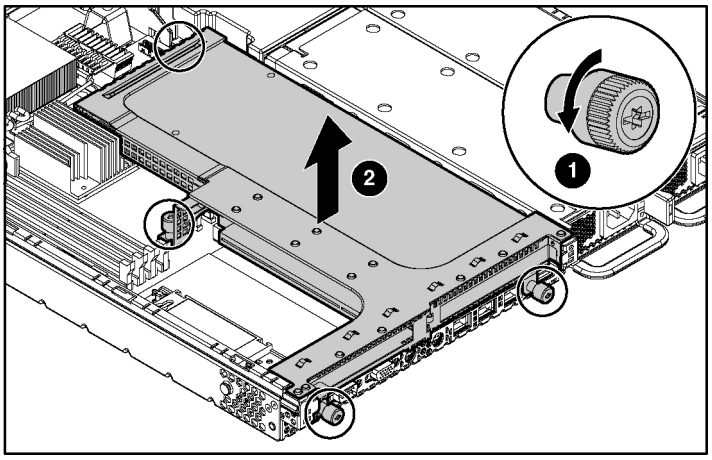
PCI Riser Board Assembly

CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

IMPORTANT: Be sure that all DIMM slot latches are closed to provide adequate clearance before removing the PCI riser board assembly with a half-length expansion board.

1. Power down the server ("Powering Down the Server" on page 16).
2. Extend the server from the rack, if applicable ("Extending the Server from the Rack" on page 17).
3. Remove the access panel ("Removing the Access Panel" on page 18).
4. Remove the PCI riser board assembly:
   a. Disconnect any internal or external cables connected to any existing expansion boards.
   b. Loosen the four PCI riser board assembly thumbscrews.

c. Lift the front of the assembly slightly and unseat the riser boards from the PCI riser board connectors.



To replace the component, reverse the removal procedure.

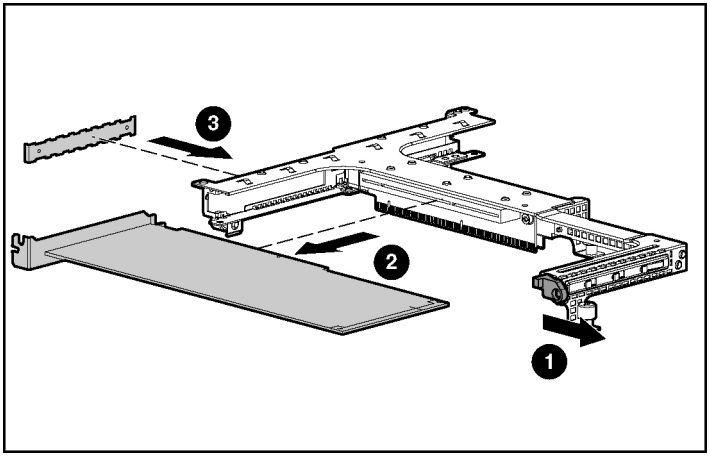
PCI Expansion Slot Definitions

Slot	Board Size	Connector	Interconnect
PCI-X expansion slot 1	Half-length	133 MHz, 3.3 V	64-bit
PCI-X expansion slot 2	Full-length	133 MHz, 3.3 V	64-bit
PCI Express expansion slot 1 (optional)	Half-length	x8	x1, x4, or x8
PCI Express expansion slot 2 (optional)	Full-length	x8	x1, x4, or x8

PCI-X or PCI Express Expansion Board

1. Remove the PCI Riser Board Assembly ("PCI Riser Board Assembly" on page 33).

2. Remove any expansion board installed in the assembly.



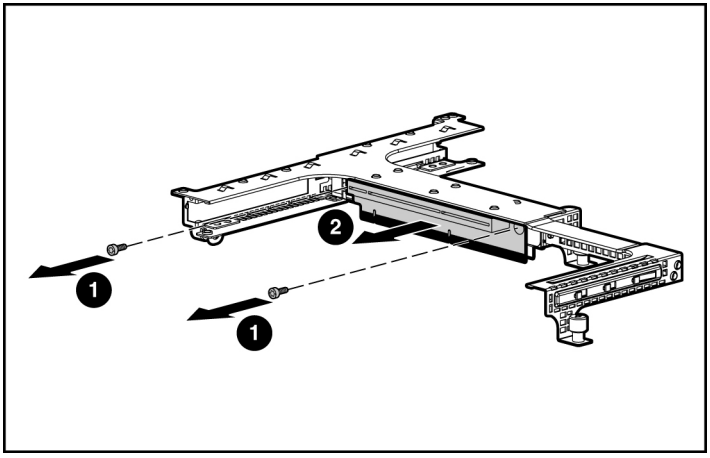
To replace the component, reverse the removal procedure.

PCI Riser Board

1. Remove the PCI Riser Board Assembly ("PCI Riser Board Assembly" on page 33).
2. Remove any expansion board installed in the assembly ("PCI-X or PCI Express Expansion Board" on page 34).
3. Remove the applicable PCI riser boards from the assembly:

   IMPORTANT: When removing the two parts of the riser board, pay attention to the orientation of the slots on each side. This information is important for subsequent procedures.

a. Remove the riser board with the slot for full-length expansion boards.



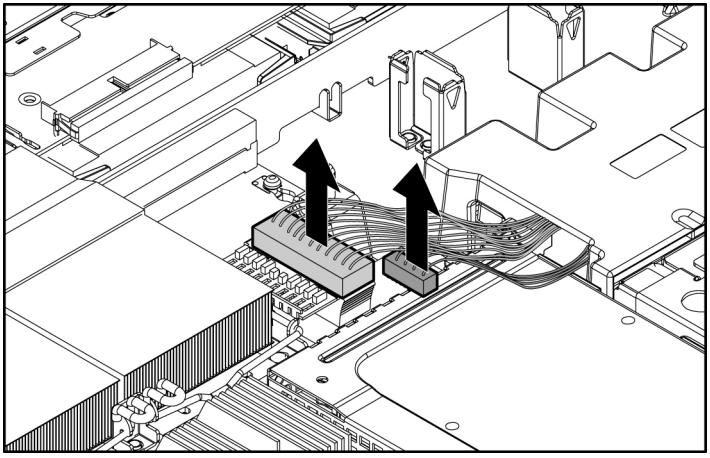
b. Repeat the previous step for the riser board with the slot for half-length expansion boards, if needed.

To replace the component, reverse the removal procedure.

Power Converter Module

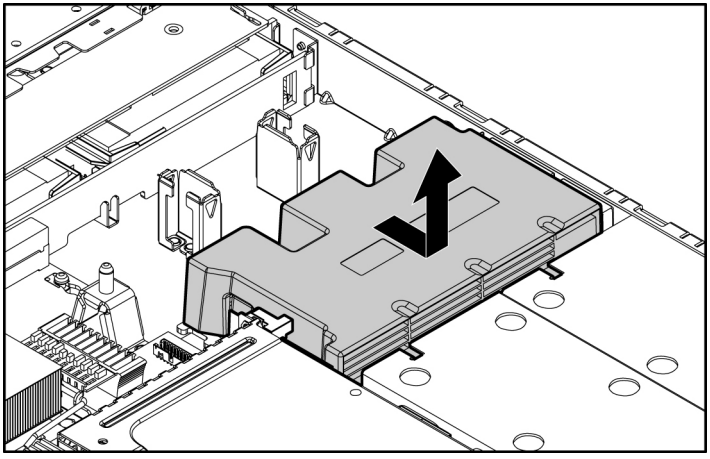
1. Power down the server ("Powering Down the Server" on page 16).
2. Remove all hot-plug power supplies ("Hot-Plug AC Power Supply" on page 27).
3. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
4. Remove the access panel ("Removing the Access Panel" on page 18).

5. Disconnect all internal power cables.



6. Remove the fan module ("Processor Fan Assembly" on page 29).
7. Slide the power converter module toward the back of the server, then lift the power converter module from the server.

NOTE: Cables are removed for clarity.



To replace the component, reverse the removal procedure.

Battery-Backed Write Cache Enabler

The Battery-Backed Write Cache Enabler, also called the battery pack, works with the cache module to provide transportable data protection, increase overall controller performance, and maintain any cached data for up to 72 hours. The NiMH batteries in the battery pack are continuously recharged through a trickle-charging process whenever the system power is on. Under normal operating conditions, the battery pack lasts for 3 years before replacement is necessary.

CAUTION: To prevent damage to the equipment or server malfunction, do not add or remove the battery module while an array capacity expansion, RAID level migration, or stripe size migration is in progress.

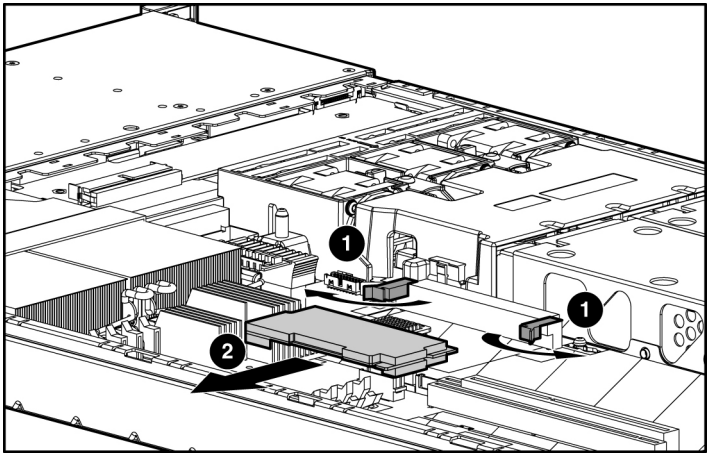
IMPORTANT: The battery module may have a low charge when installed. In this case, a POST error message is displayed when the server is powered up, indicating that the battery module is temporarily disabled. No action is necessary on your part. The internal circuitry automatically recharges the batteries and enables the battery module. This process may take up to 4 hours. During this time, the array controller will function properly, but without the performance advantage of the battery module.

NOTE: The data protection and the time limit also apply if a power outage occurs. When power is restored to the system, an initialization process writes the preserved data to the hard drives.

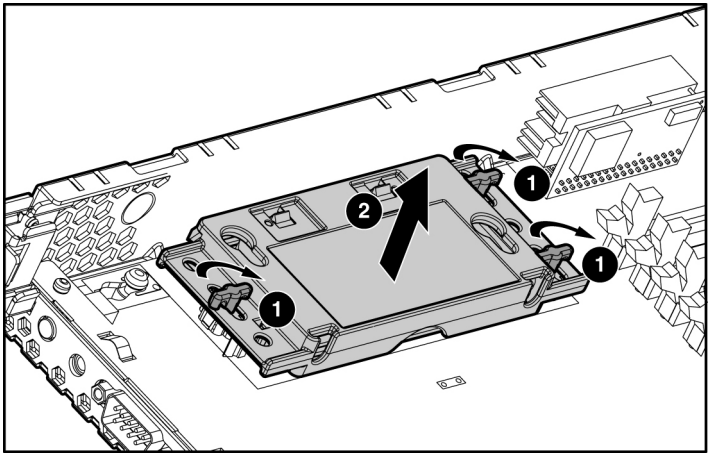
1. Power down the server ("Powering Down the Server" on page 16).
2. Extend the server from the rack, if applicable ("Extending the Server from the Rack" on page 17).
3. Remove the access panel ("Removing the Access Panel" on page 18).

IMPORTANT: Data in the BBWCE will be erased when you disconnect the battery.

4. Disconnect the battery module cable from the BBWCE and from the Smart Array 6i memory connector on the system board.



5. Remove the battery module cable from the cable clip on the system board.
6. Remove the Smart Array 6i memory module.
7. Turn the quarter-turn fasteners counter-clockwise to unlock the module.
8. Lift the battery module from the server.



9. Remove the battery from the module.

To replace the component, reverse the removal procedure.

Memory Options

You can expand server memory by installing PC2700 DDR SDRAM DIMMs. The system supports up to four ECC Registered DDR SDRAM DIMMs.

> **NOTE:** The Advanced Memory Protection option in RBSU provides additional memory protection beyond Advanced ECC. By default, the server is set to **Advanced ECC Support**. Refer to "ROM-Based Setup Utility ("HP ROM-Based Setup Utility" on page 56)," on the Documentation CD, for more information.

The server supports two types of memory configurations:

- Standard memory configuration for maximum performance with up to 8 GB of active memory (four 2-GB memory modules)
- Online spare memory configuration for maximum availability with up to 4 GB of active memory while simultaneously supporting up to 4 GB of online spare memory

DIMM Installation Guidelines

You must observe the following guidelines when installing additional memory:

- DIMMs installed in the server must be Registered DDR DRAM, 2.5 volts, 64 bits wide, and ECC.
- DIMMs in slots 1A and 2A must match.
- DIMMs in slots 3B and 4B must match and must be installed as a pair.
- All DIMMs installed must be the same speed. Do not install DIMM modules supporting different speeds.
- Install DIMMs into both slots within a single bank. DIMMs must be installed in order. Upgrade memory by installing DIMM pairs into banks in sequential bank order, starting with bank B.

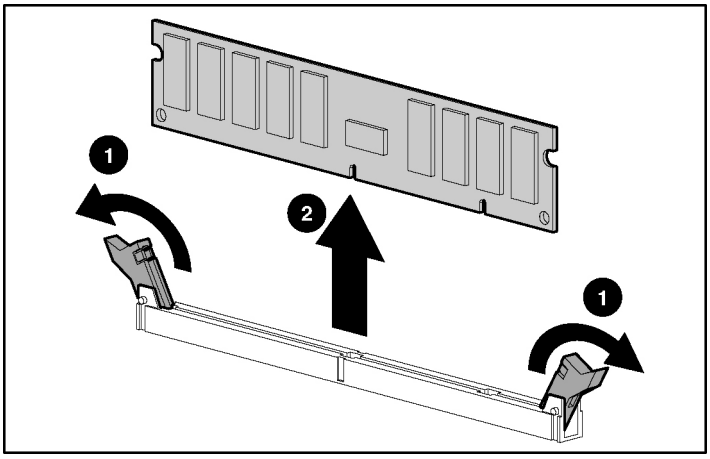
DIMM

1. Power down the server ("Powering Down the Server" on page 16).

2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
3. Remove the access panel ("Removing the Access Panel" on page 18).

   NOTE: The server ships with at least two DIMMs installed in DIMM slots 1A and 2A.

4. If necessary, remove the PCI Riser Board Assembly ("PCI Riser Board Assembly" on page 33).
5. Remove the DIMM.



CAUTION: Be sure to install DIMMs in the proper configuration. Refer to the Documentation CD.

CAUTION: Use only Compaq branded or HP DIMMs. DIMMs from other sources may adversely affect data integrity.

IMPORTANT: DIMMs do not seat fully if turned the wrong way.

To replace a DIMM, align the DIMM with the slot and insert the DIMM firmly. When fully seated, the DIMM slot latches lock into place.

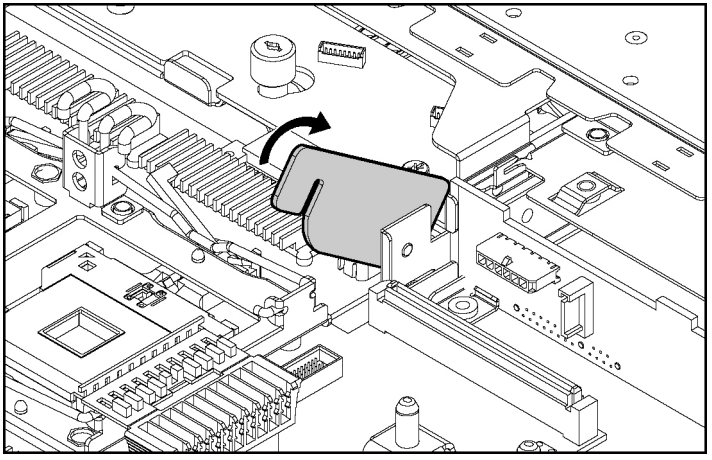
Processor

CAUTION: To prevent thermal instability and damage to the server, do not separate the processor from the heatsink. The processor, heatsink, and retaining clip make up a single assembly.

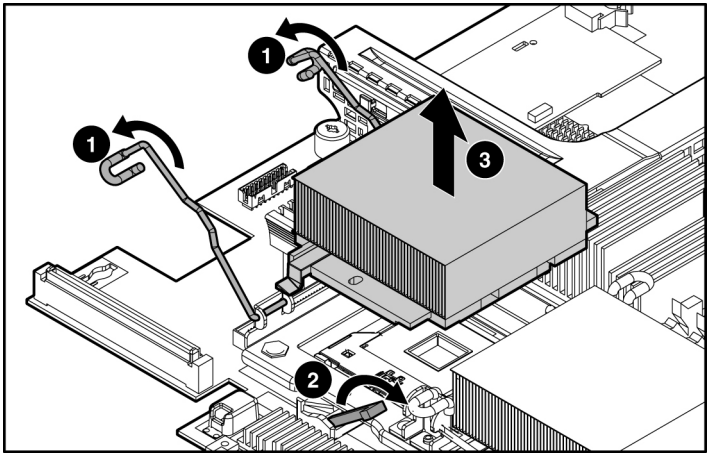
CAUTION: To prevent possible server malfunction and damage to the equipment, do not mix processors of different types.

To remove a processor:

1. Power down the server ("Powering Down the Server" on page 16).
2. Extend the server from the rack, if applicable ("Extending the Server from the Rack" on page 17).
3. Remove the access panel ("Removing the Access Panel" on page 18).
4. Rotate the baffle upward.



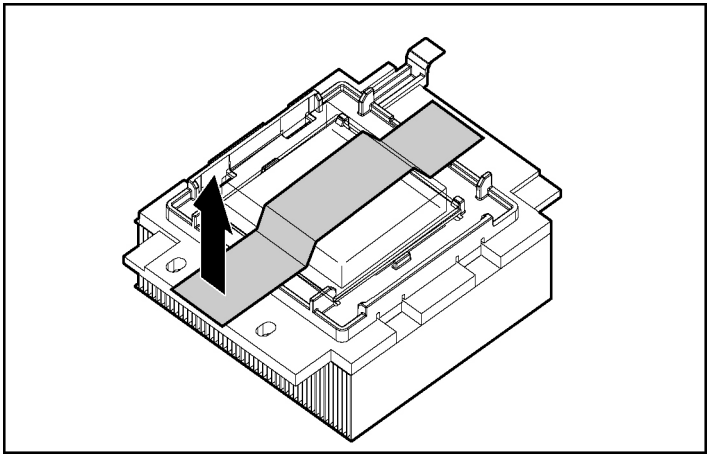
5. Release the processor retaining clips and processor locking lever.



6. Lift the heatsink and processor from the server.

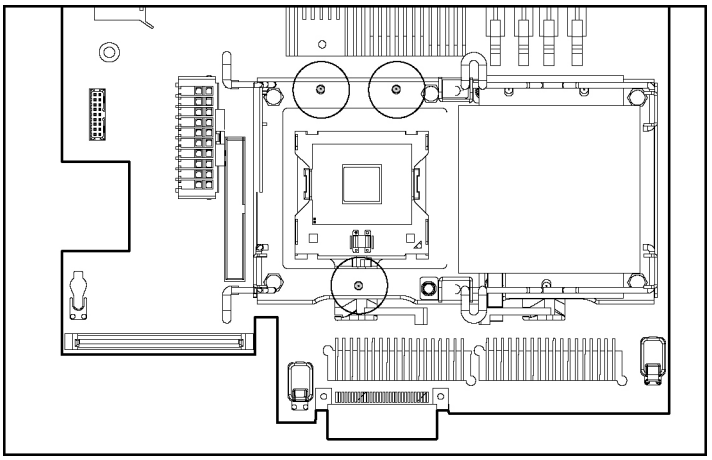
To install the processor in the server:

1. Remove the protective cover from the processor.

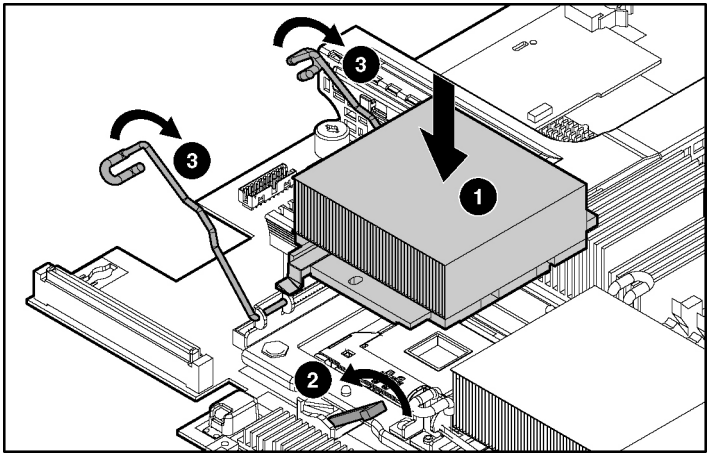


2. Align the holes in the heatsink with the guiding pegs on the processor cage.

CAUTION: To prevent possible server malfunction or damage to the equipment, be sure to align the processor pins with the corresponding holes in the socket.



3. Install the processor and close the processor locking lever and processor retaining clips.



4. Rotate the baffle into position
5. Install the access panel.

Battery

If the server no longer automatically displays the correct date and time, you may need to replace the battery that provides power to the real-time clock. Under normal use, battery life is 5 to 10 years.

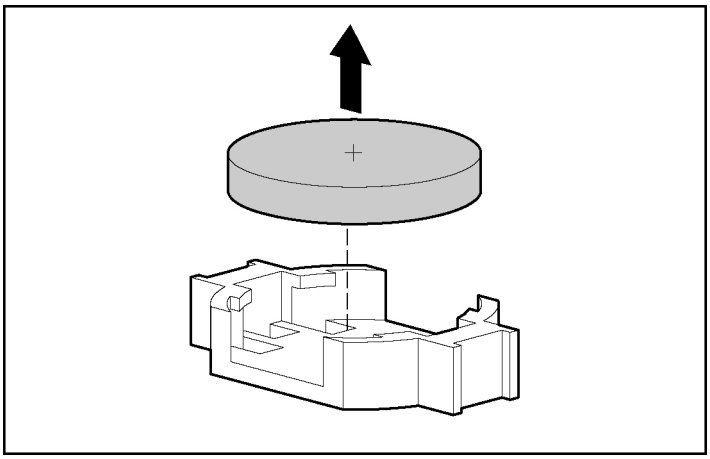
WARNING: The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:

- **Do not attempt to recharge the battery.**
- **Do not expose the battery to temperatures higher than 60°C (140°F).**
- **Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.**
- **Replace only with the spare designated for this product.**

1. Power down the server ("Powering Down the Server" on page 16).
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
3. Remove the access panel ("Removing the Access Panel" on page 18).
4. Remove the PCI riser cage ("PCI Riser Board Assembly" on page 33).

CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Remove the battery.



IMPORTANT: Replacing the system board battery resets the system ROM to its default configuration. After replacing the battery, reconfigure the system through RBSU.

To replace the component, reverse the removal procedure.

For more information about battery replacement or proper disposal, contact an authorized reseller or an authorized service provider.

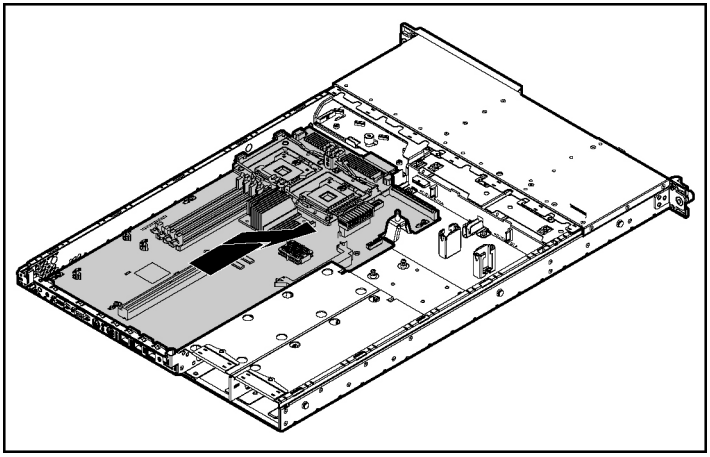
System Board

1. Power down the server ("Powering Down the Server" on page 16).
2. Extend or remove the server from the rack ("Extending the Server from the Rack" on page 17).
3. Remove the access panel ("Removing the Access Panel" on page 18).
4. Remove the PCI Riser Board Assembly ("PCI Riser Board Assembly" on page 33).

CAUTION: To prevent damage to the server or expansion boards, power down the server and remove all AC power cords before removing or installing the PCI riser cage.

5. Remove the processor fan module ("Processor Fan Assembly" on page 29).

6. Remove the BBWCE ("Battery-Backed Write Cache Enabler" on page 38).
7. Remove any DIMMs ("DIMM" on page 40).
8. Remove the processors ("Processor" on page 42).
9. Disconnect all cables connected to the system board. For additional information, refer to "Server Cabling" ("Server Cabling" on page 49).
10. Remove the system board.



IMPORTANT: If replacing the system board or clearing NVRAM, you must re-enter the server serial number through RBSU.

To replace the component, reverse the removal procedure.

Re-Entering the Server Serial Number and Product ID

After you replace the system board, you must re-enter the server serial number and the product ID.

1. During the server startup sequence, press the **F9** key to access RBSU.
2. Select the **Advanced Options** menu.
3. Select **Serial Number**. The following warning is displayed:

```
Warning: The serial number should ONLY be modified by
qualified service personnel. This value should always
match the serial number located on the chassis.
```

4. Press the **Enter** key to clear the warning.
5. Enter the serial number.
6. Select **Product ID**. The following warning is displayed.

   ```
   Warning: The Product ID should ONLY be modified by
   qualified service personnel. This value should always
   match the Product ID located on the chassis.
   ```

7. Enter the product ID and press the **Enter** key.
8. Press the **Escape** key to close the menu.
9. Press the **Escape** key to exit RBSU.
10. Press the **F10** key to confirm exiting RBSU. The server will automatically reboot.

Server Cabling

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Server Cable Routing.....50
SATA Cable Routing.....51

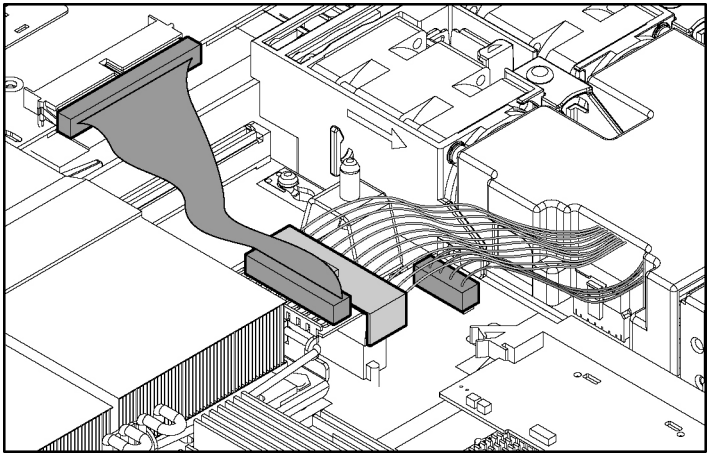
Cabling Overview

This section provides guidelines that help you make informed decisions about cabling the server and hardware options to optimize performance.

For information on cabling peripheral components, refer to the white paper on high-density deployment at the HP website (http://www.hp.com/products/servers/platforms).

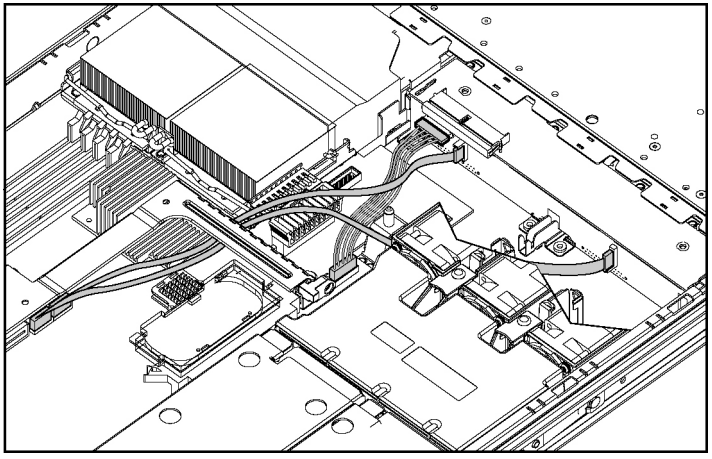
Server Cable Routing

CAUTION: When routing cables, always be sure that the cables are not in a position where they can be pinched or crimped.



SATA Cable Routing

CAUTION: When routing cables, always be sure that the cables are not in a position where they can be pinched or crimped.



Diagnostic Tools

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SmartStart Software

SmartStart is a collection of software that optimizes single-server setup, providing a simple and consistent way to deploy server configuration. SmartStart has been tested on many ProLiant server products, resulting in proven, reliable configurations.

SmartStart assists the deployment process by performing a wide range of configuration activities, including:

- Configuring hardware using embedded configuration utilities, such as RBSU and ORCA
- Preparing the system for installing "off-the-shelf" versions of leading operating system software
- Installing optimized server drivers, management agents, and utilities automatically with every assisted installation

- Testing server hardware using the Insight Diagnostics Utility ("HP Insight Diagnostics" on page 59)
- Installing software drivers directly from the CD. With systems that have internet connection, the SmartStart Autorun Menu provides access to a complete list of ProLiant system software.
- Enabling access to the Array Configuration Utility, Array Diagnostics Utility, and Erase Utility

SmartStart is included in the HP ProLiant Essentials Foundation Pack. For more information about SmartStart software, refer to the HP ProLiant Essentials Foundation Pack or the HP website (http://www.hp.com/servers/smartstart).

SmartStart Scripting Toolkit

The SmartStart Scripting Toolkit is a server deployment product that delivers an unattended automated installation for high-volume server deployments. The SmartStart Scripting Toolkit is designed to support ProLiant BL, ML, and DL servers. The toolkit includes a modular set of utilities and important documentation that describes how to apply these new tools to build an automated server deployment process.

Using SmartStart technology, the Scripting Toolkit provides a flexible way to create standard server configuration scripts. These scripts are used to automate many of the manual steps in the server configuration process. This automated server configuration process cuts time from each server deployed, making it possible to scale server deployments to high volumes in rapid fashion.

For more information, and to download the SmartStart Scripting Toolkit, refer to the HP website (http://www.hp.com/servers/sstoolkit).

HP Instant Support Enterprise Edition

ISEE is a proactive remote monitoring and diagnostic tool to help manage your systems and devices, a feature of HP support. ISEE provides continuous hardware event monitoring and automated notification to identify and prevent potential critical problems. Through remote diagnostic scripts and vital system configuration information collected about your systems, ISEE enables fast restoration of your systems. Install ISEE on your systems to help mitigate risk and prevent potential critical problems.

For more information on ISEE, refer to the HP website (http://www.hp.com/hps/hardware/hw_enterprise.html).

To download HP ISEE, visit the HP website (http://www.hp.com/hps/hardware/hw_downloads.html).

For installation information, refer to the HP ISEE Client Installation and Upgrade Guide (ftp://ftp.hp.com/pub/services/hardware/info/isee_client.pdf).

Option ROM Configuration for Arrays

Before installing an operating system, you can use the ORCA utility to create the first logical drive, assign RAID levels, and establish online spare configurations.

The utility provides support for the following functions:

- Configuring one or more logical drives using physical drives on one or more SCSI buses
- Viewing the current logical drive configuration
- Deleting a logical drive configuration

If you do not use the utility, ORCA will default to the standard configuration.

For more information regarding array controller configuration, refer to the controller user guide.

For more information regarding the default configurations that ORCA uses, refer to the *HP ROM-Based Setup Utility User Guide* on the Documentation CD.

HP ROM-Based Setup Utility

RBSU, an embedded configuration utility, performs a wide range of configuration activities that may include:

- Configuring system devices and installed options
- Displaying system information
- Selecting the primary boot controller
- Configuring memory options
- Language selection

For more information on RBSU, refer to the *HP ROM-Based Setup Utility User Guide* on the Documentation CD or the HP website (http://www.hp.com/servers/smartstart).

ROMPaq Utility

Flash ROM enables you to upgrade the firmware (BIOS) with system or option ROMPaq utilities. To upgrade the BIOS, insert a ROMPaq diskette into the diskette drive and boot the system.

The ROMPaq utility checks the system and provides a choice (if more than one exists) of available ROM revisions. This procedure is the same for both system and option ROMPaq utilities.

For more information about the ROMPaq utility, refer to the HP website (http://www.hp.com/servers/manage).

System Online ROM Flash Component Utility

The Online ROM Flash Component Utility enables system administrators to efficiently upgrade system or controller ROM images across a wide range of servers and array controllers. This tool has the following features:

- Works offline and online

- Supports Microsoft® Windows NT®, Windows® 2000, Windows® Server 2003, Novell Netware, and Linux operating systems

  IMPORTANT: This utility supports operating systems that may not be supported by the server. For operating systems supported by the server, refer to the HP website (http://www.hp.com/go/supportos).

- Integrates with other software maintenance, deployment, and operating system tools
- Automatically checks for hardware, firmware, and operating system dependencies, and installs only the correct ROM upgrades required by each target server

To download the tool and for more information, refer to the HP website (http://h18000.www1.hp.com/support/files/index.html).

Integrated Management Log

The IML records hundreds of events and stores them in an easy-to-view form. The IML timestamps each event with 1-minute granularity.

You can view recorded events in the IML in several ways, including the following:

- From within HP SIM
- From within Survey Utility
- From within operating system-specific IML viewers
  - For NetWare: IML Viewer
  - For Windows®: IML Viewer
  - For Linux: IML Viewer Application
- From within HP Insight Diagnostics

For more information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack.

Integrated Lights-Out Technology

The iLO subsystem is a standard component of selected ProLiant servers that provides server health and remote server manageability. The iLO subsystem includes an intelligent microprocessor, secure memory, and a dedicated network interface. This design makes iLO independent of the host server and its operating system. The iLO subsystem provides remote access to any authorized network client, sends alerts, and provides other server management functions.

Using iLO, you can:

- Remotely power up, power down, or reboot the host server.
- Send alerts from iLO regardless of the state of the host server.
- Access advanced troubleshooting features through the iLO interface.
- Diagnose iLO using HP SIM through a web browser and SNMP alerting.

For more information about iLO features, refer to the *Integrated Lights-Out User Guide* on the Documentation CD or on the HP website (http://www.hp.com/servers/lights-out).

Automatic Server Recovery

ASR is a feature that causes the system to restart when a catastrophic operating system error occurs, such as a blue screen, ABEND, or panic. A system fail-safe timer, the ASR timer, starts when the System Management driver, also known as the Health Driver, is loaded. When the operating system is functioning properly, the system periodically resets the timer. However, when the operating system fails, the timer expires and restarts the server.

ASR increases server availability by restarting the server within a specified time after a system hang or shutdown. At the same time, the HP SIM console notifies you by sending a message to a designated pager number that ASR has restarted the system. You can disable ASR from the HP SIM console or through RBSU.

HP Systems Insight Manager

HP SIM is a web-based application that allows system administrators to accomplish normal administrative tasks from any remote location, using a web browser. HP SIM provides device management capabilities that consolidate and integrate management data from HP and third-party devices.

> **IMPORTANT:** You must install and use HP SIM to benefit from the Pre-Failure Warranty for processors, hard drives, and memory modules.

For additional information, refer to the Management CD in the HP ProLiant Essentials Foundation Pack or the HP SIM website (http://www.hp.com/go/hpsim).

HP Insight Diagnostics

The HP Insight Diagnostics utility displays information about the server hardware and tests the system to be sure it is operating properly. The utility has online help and can be accessed using the SmartStart CD. Online Diagnostics for Microsoft® Windows® is available for download from the HP website (http://www.hp.com/support).

USB Support

HP provides both standard USB support and legacy USB support. Standard support is provided by the operating system through the appropriate USB device drivers. HP provides support for USB devices before the operating system loading through legacy USB support, which is enabled by default in the system ROM. HP hardware supports USB version 1.1 or 2.0, depending on the version of the hardware.

Legacy USB support provides USB functionality in environments where USB support is normally not available. Specifically, HP provides legacy USB functionality for:

- POST
- RBSU

- Diagnostics
- DOS
- Operating environments which do not provide native USB support

For more information on ProLiant USB support, refer to the HP website (http://h18004.www1.hp.com/products/servers/platforms/usb-support.html).

Internal USB Functionality

An internal USB connector is available for use with USB drive keys only. The internal connector shares the same bus with the front external USB connector, and connecting a device to both the front internal and front external USB connectors is not supported. This solution provides for use of a permanent boot drive from a USB drive key installed in the front internal connector, avoiding issues of clearance on the front of the rack and physical access to secure data.

For additional security, you can disable the front USB connectors through RBSU. Disabling external USB ports in RBSU disables both the front external and front internal USB ports.

Server Component Identification

In This Section

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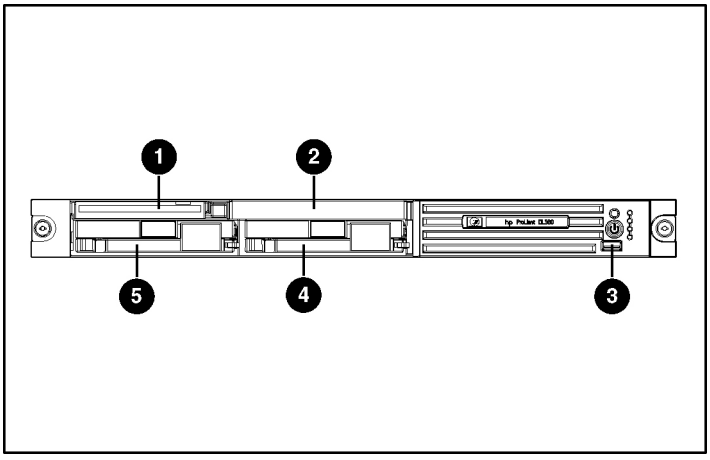
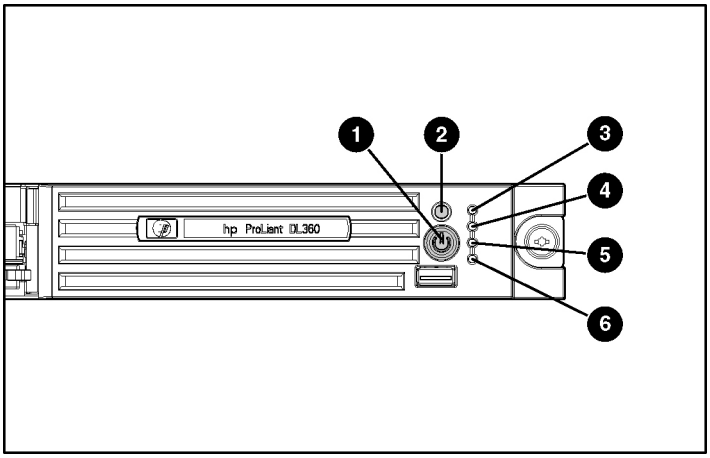
Front Panel Components



Item	Description
1	Diskette drive bay
2	Optical device bay
3	Front USB port
4	Hard drive bay 0
5	Hard drive bay 1

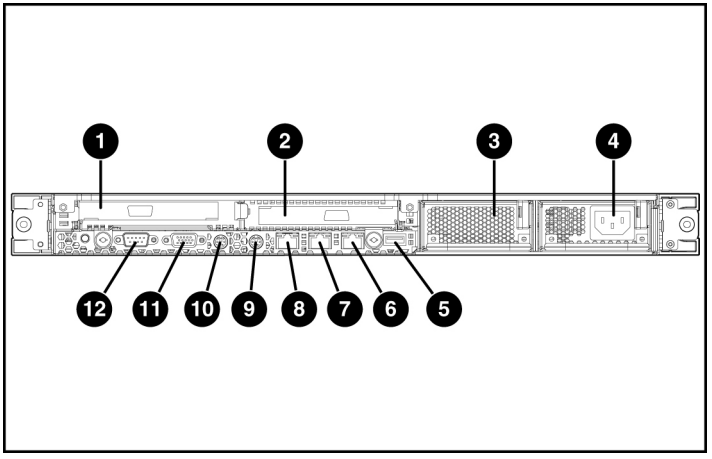
Front Panel LEDs and Buttons



Item	Description	Status
1	Power On/Standby button and system power LED	Green = System is on. Amber = System is shut down, but power is still applied. Off = Power cord is not attached, power supply failure has occurred, no power supplies are installed, facility power is not available, or the DC-to-DC converter is not installed.
2	UID button/LED	Blue = Identification is activated. Flashing blue = System is being remotely managed. Off = Identification is deactivated.
3	Internal health LED	Green = System health is normal. Amber = System is degraded. To identify the component in a degraded state, refer to system board LEDs (on page 69). Red = System critical. To identify the component in a critical state, refer to system board LEDs (on page 69). Off = System health is normal (when in standby mode).
4	External health LED (power supply)	Green = Power supply health is normal. Amber = Power redundancy failure occurred. Off = Power redundancy failure has occurred. When the server is in standby mode, power supply health is normal.

Item	Description	Status
5	NIC 1 link/activity LED	Green = Network link exists. Flashing green = Network link and activity exist. Off = No link to network exists. If power is off, view the LEDs on the RJ-45 connector for status by referring to the rear panel LEDs ("Rear Panel LEDs and Buttons" on page 65).
6	NIC 2 link/activity LED	Green = Network link exists. Flashing green = Network link and activity exist. Off = No link to network exists. If power is off, the front panel LED is not active. View the LEDs on the RJ-45 connector for status by referring to the rear panel LEDs ("Rear Panel LEDs and Buttons" on page 65).

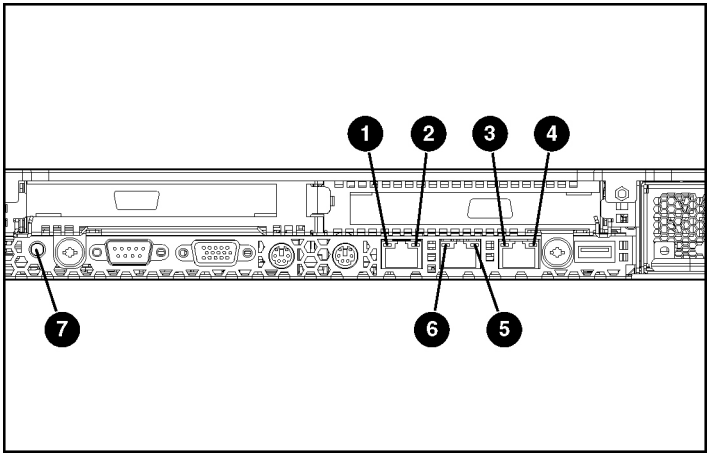
Rear Panel Components



Item	Description
1	PCI-X expansion slot 1, 64-bit/133-MHz 3.3V (optional PCI Express slot 1, x8)

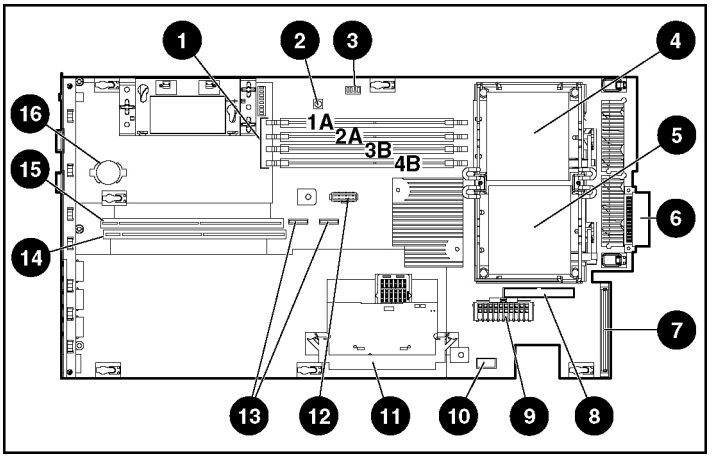
Item	Description
2	PCI-X expansion slot 2, 64-bit/133-MHz 3.3V (optional PCI Express slot 2, x8)
3	Power supply bay 2
4	Power supply bay 1 (populated)
5	Rear USB connector
6	10/100/1000 NIC 2
7	10/100/1000 NIC 1
8	iLO management port
9	Mouse connector
10	Keyboard connector
11	Video connector
12	Serial connector

Rear Panel LEDs and Buttons



Item	Description	Status
1	iLO activity	Green = Activity exists. Flashing green = Activity exists. Off = No activity exists.
2	iLO link	Green = Link exists. Off = No link exists.
3	10/100/1000 NIC 2 activity	Green = Link exists. Flashing green = Activity exists. Off = No link exists.
4	10/100/1000 NIC 2 link	Green = Link exists. Off = No link exists.
5	10/100/1000 NIC 1 link	Green = Link exists. Off = No link exists.
6	10/100/1000 NIC 1 activity	Green = Activity exists. Flashing green = Activity exists. Off = No activity exists.
7	UID button/LED	Blue = Identification is activated. Flashing blue = System is being managed remotely. Off = Identification is deactivated.

System Board Components



Item	Description	Item	Description
1	DIMM slots (1-4)	9	Power supply connector
2	NMI switch	10	Power supply signal connector
3	System maintenance switch (SW2)	11	Smart Array 6i memory module connector*
4	Processor 1 socket	12	Remote management connector
5	Processor 2 socket	13	SATA connectors (SATA model only)
6	Processor zone fan module connector	14	PCI riser board assembly connector (for slot 2 riser board)
7	SCSI backplane connector*	15	PCI riser board assembly connector (for slot 1 riser board)
8	Optical device connector	16	System battery

* For SCSI models only

System Maintenance Switch

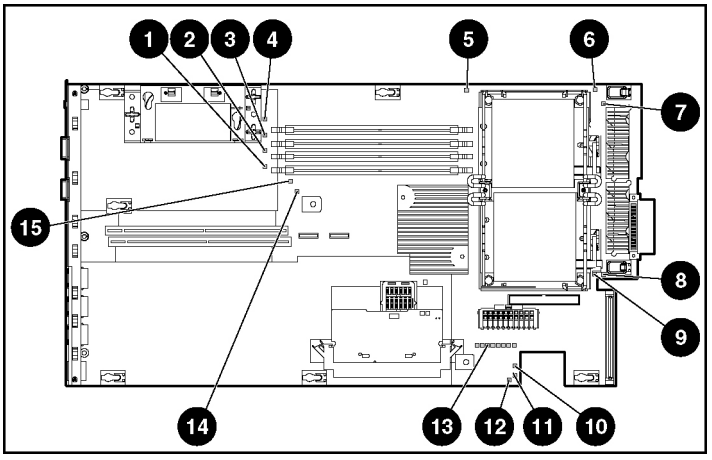
Position	Default	Function
S1	Off	Off = iLO security is enabled. On = iLO security is disabled.
S2	Off	Off = System configuration can be changed. On = System configuration is locked.
S3	Off	Reserved
S4	Off	Reserved
S5	Off	Off = Power-on password is enabled. On = Power-on password is disabled.
S6	Off	Off = No function On = ROM treats the system configuration as invalid.
S7, S8	Off, Off	Debug LEDs

NMI Switch

The NMI switch allows administrators to perform a memory dump before performing a hard reset. Crash dump analysis is an essential part of eliminating reliability problems, such as hangs or crashes in operating systems, device drivers, and applications. Many crashes freeze a system, requiring you to do a hard reset. Resetting the system erases any information that would support root cause analysis.

Systems running Microsoft® Windows® operating systems experience a blue screen trap when the operating system crashes. When this happens, Microsoft® recommends that system administrators perform an NMI event by pressing a dump switch. The NMI event enables a hung system to become responsive again.

System Board LEDs



Item	LED Description	Status
1	DIMM 4B failure	Amber = DIMM has failed. Off = DIMM is operating normally.
2	DIMM 3B failure	Amber = DIMM has failed. Off = DIMM is operating normally
3	DIMM 2A failure	Amber = DIMM has failed. Off = DIMM is operating normally.
4	DIMM 1A failure	Amber = DIMM has failed. Off = DIMM is operating normally
5	Overtemperature	Amber = System has reached cautionary or critical temperature level. Off = Temperature is OK.
6	Processor 1 failure	Amber = Processor has failed. Off = Processor is operating normally.
7	PPM 1 failure	Amber = PPM has failed. Off = PPM is operating normally.

Item	LED Description	Status
8	PPM 2 failure	Amber = PPM has failed. Off = PPM is operating normally.
9	Processor 2 failure	Amber = Processor has failed. Off = Processor is operating normally.
10	Power supply signal connector interlock failure	Amber = Power supply signal cable is not connected. Off = Power supply signal cable is connected.
11	Standby power good	Green = Auxiliary power is applied. Off = Auxiliary power is not applied.
12	Power supply fan module failure	Amber = One fan in this module has failed. Red = Multiple fans in this module have failed. Off = All fans in this module are operating normally.
13	System diagnostic	Refer to the *HP Remote Lights-Out Edition II User Guide* on the Documentation CD.
14	Online spare memory	Amber = Failover has occurred. Online spare memory is in use. Green = Online spare memory is enabled, but not in use. Off = Online spare memory is disabled.
15	Riser interlock	Amber = PCI riser assembly is not seated. Off = PCI riser assembly is seated.

System LEDs and Internal Health LED Combinations

When the internal health LED on the front panel illuminates either amber or red, the server is experiencing a health event. Combinations of illuminated system LEDs and the internal health LED indicate system status.

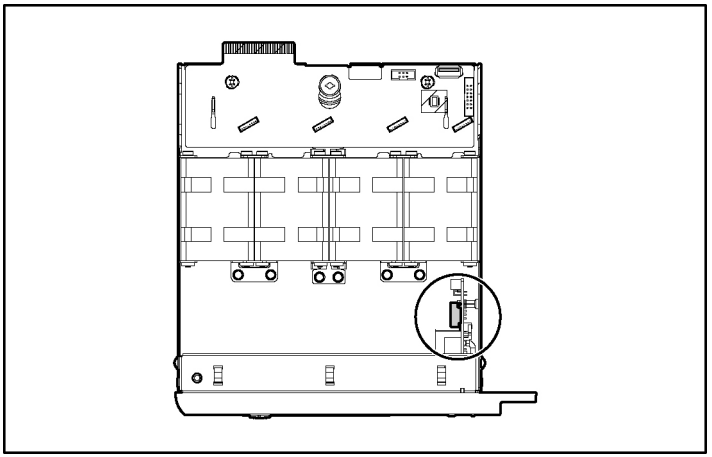
The front panel health LEDs indicate only the current hardware status. In some situations, HP SIM may report server status differently than the health LEDs because the software tracks more system attributes.

System LED and Color	Internal Health LED Color	Status
Processor failure, socket *X* (Amber)	Red	One or more of the following conditions may exist: • Processor in socket *X* has failed. • Processor in socket *X* failed over to the offline spare. • Processor *X* is not installed in the socket. • Processor *X* is unsupported. • ROM detects a failed processor during POST.
	Amber	Processor in socket *X* is in a pre-failure condition.
Processor failure, both sockets (Amber)	Red	Processor types are mismatched.
PPM failure (Amber)	Red	PPM has failed.
DIMM failure, slot *X* (Amber)	Red	• DIMM in slot *X* has failed. • DIMM in slot *X* is an unsupported type, and no valid memory exists in another bank.
	Amber	• DIMM in slot *X* has reached single-bit correctable error threshold. • DIMM in slot *X* is in a pre-failure condition. • DIMM in slot *X* is an unsupported type, but valid memory exists in another bank.
DIMM failure, all slots in one bank (Amber)	Red	No valid or usable memory is installed in the system.
Overtemperature (Amber)	Amber	The Health Driver has detected a cautionary temperature level.
	Red	The server has detected a hardware critical temperature level.
Riser interlock (Amber)	Red	The PCI riser board assembly is not seated.
Online spare memory (Amber)	Amber	Bank *X* failed over to the online spare memory bank.

System LED and Color	Internal Health LED Color	Status
Power converter module interlock (Amber)	Red	The power converter module is not seated.
Fan module (Amber)	Amber	A redundant fan has failed.
Fan module (Red)	Red	The minimum fan requirements are not being met in one or more of the fan modules. One or more fans have failed or are missing.
Power supply signal interlock (Amber)	Red	The power supply signal cable is not connected to the system board.

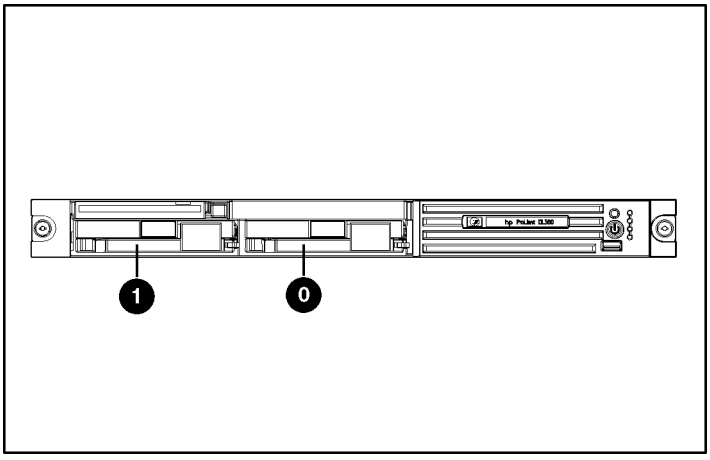
Internal USB Connector

The front internal USB connector is located in the processor zone fan module.

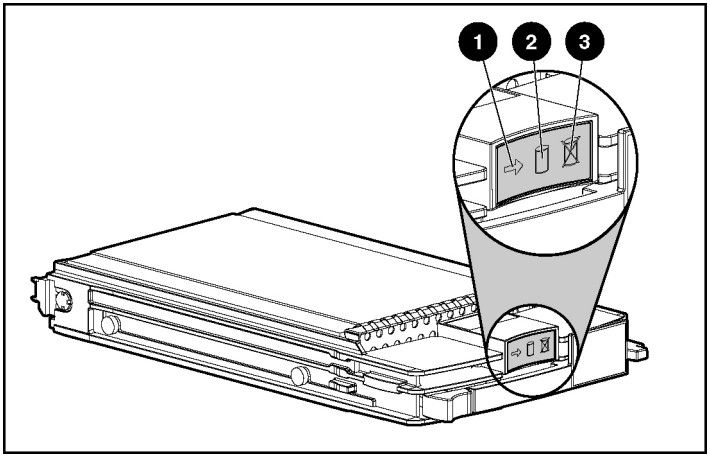


For more information, refer to "Internal USB Functionality (on page 60)."

SCSI IDs and SATA Device Numbers



Hot-Plug SCSI Hard Drive LEDs



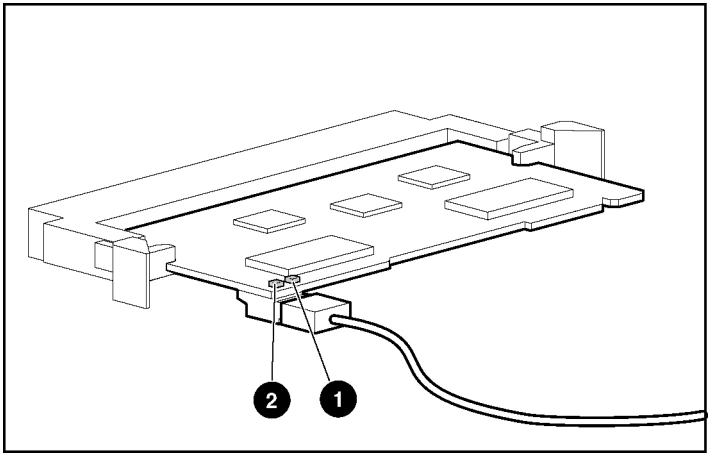
Item	LED Description	Status
1	Activity status	On = Drive activity Flashing = High activity on the drive or drive is being configured as part of an array. Off = No drive activity
2	Online status	On = Drive is part of an array and is currently working. Flashing = Drive is actively online. Off = Drive is offline.
3	Fault status	On = Drive failure Flashing = Fault-process activity Off = No fault-process activity

Hot-Plug SCSI Hard Drive LED Combinations

Activity LED (1)	Online LED (2)	Fault LED (3)	Interpretation
On, off, or flashing	On or off	Flashing	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.
On, off, or flashing	On	Off	The drive is online and is configured as part of an array. If the array is configured for fault tolerance and all other drives in the array are online, and a predictive failure alert is received or a drive capacity upgrade is in progress, you may replace the drive online.
On or flashing	Flashing	Off	**Do not remove the drive. Removing a drive may terminate the current operation and cause data loss.** The drive is rebuilding or undergoing capacity expansion.
On	Off	Off	**Do not remove the drive.** The drive is being accessed, but (1) it is not configured as part of an array; (2) it is a replacement drive and rebuild has not yet started; or (3) it is spinning up during the POST sequence.

Activity LED (1)	Online LED (2)	Fault LED (3)	Interpretation
Flashing	Flashing	Flashing	**Do not remove the drive. Removing a drive may cause data loss in non-fault-tolerant configurations.** Either (1) the drive is part of an array being selected by an array configuration utility; (2) Drive Identification has been selected in HP SIM; or (3) drive firmware is being updated.
Off	Off	On	The drive has failed and has been placed offline. You may replace the drive.
Off	Off	Off	Either (1) the drive is not configured as part of an array; (2) the drive is configured as part of an array, but it is a replacement drive that is not being accessed or being rebuilt yet; or (3) the drive is configured as an online spare. If the drive is connected to an array controller, you may replace the drive online.

Optional Battery-Backed Write Cache Enabler LEDs



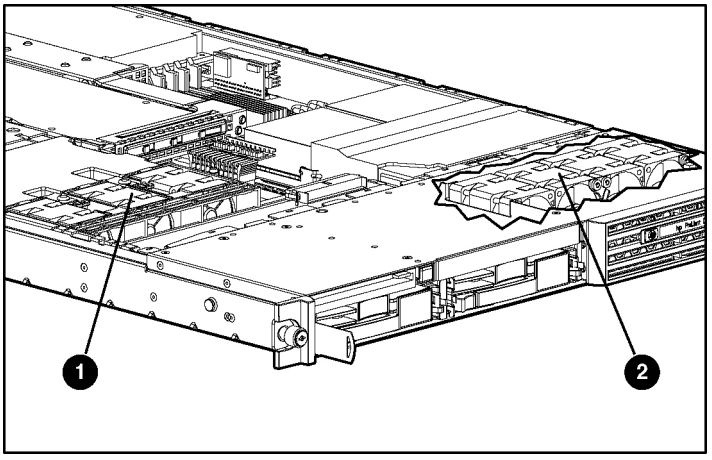
Item	LED Color
1	Amber
2	Green

For LED status information, refer to "Battery-Backed Write Cache Enabler LED Statuses (on page 76)."

Battery-Backed Write Cache Enabler LED Statuses

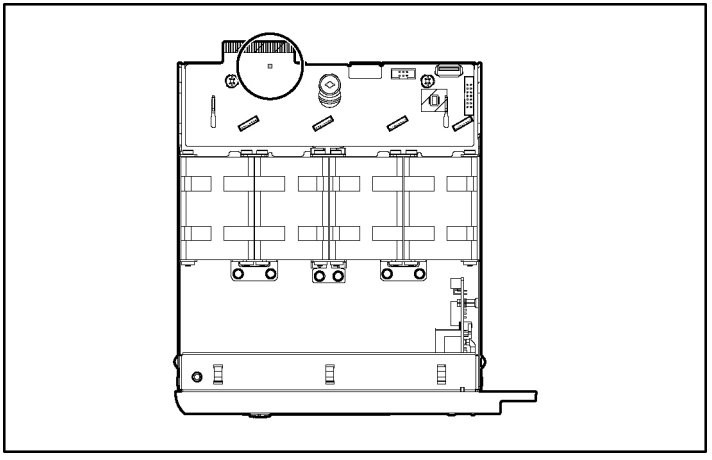
Server Status	LED Status	Battery Module Status
Server is on and has normal run time	Green = On	Fast charging
	Green = Off	Trickle charging
	Amber = On	A short exists in the connection of one or more of the four button cells within the battery module
	Amber = Blinking	An open exists in the circuit between the positive and negative terminals of the battery module
	Amber = Off	Normal
Server is on and is in the first 30 seconds after power up	Green = On Amber = On	Temporary lock-out state; data was lost due to cable being detached
Server is off and is in data retention mode	Amber = Blinking every 15 seconds	User data held in write cache is being backed up

Fan Module Locations



Item	Description
1	Power supply zone fan module
2	Processor zone fan module

Processor Zone Fan Module LED



Status
Amber = One fan in this module has failed.
Red = Multiple fans in this module have failed.
Off = All fans in this module are operating normally.

For power supply zone fan module LED information, refer to System Board LEDs (on page 69).

Specifications

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Ultra320 SCSI Hard Drive Specifications 83
Serial ATA Hard Drive Specifications 83

Server Specifications

Dimension	**Specification**
Height	4.32 cm (1.70 in)
Depth	69.22 cm (27.25 in)
Width	42.62 cm (16.78 in)
Weight (maximum)	16.78 kg (37 lb)
Weight (no drives installed)	12.47 kg (27.5 lb)
Input requirement	**Specification**
Rated input voltage	100 VAC to 240 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current	6.0 A (110 V) to 3.0 A (220 V)
Rated input power	580 W
BTUs per hour	1990
Power supply output	**Specification**
Rated steady-state power	460 W

Environmental Specifications

Temperature range*	Specification
Operating	10°C to 35°C (50°F to 95°F)
Shipping	-40°C to 70°C (-40°F to 158°F)
Maximum wet bulb temperature	28°C (82.4°F)
Relative humidity (noncondensing)**	**Specification**
Operating	10% to 90%
Non-operating	5% to 95%

* All temperature ratings shown are for sea level. An altitude derating of 1°C per 300 m (1.8°F per 1,000 ft) to 3048 m (10,000 ft) is applicable. No direct sunlight allowed.

** Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage corresponds to a pressure minimum of 70 KPa.

Hot-Plug Power Supply Calculations

For hot-plug power supply specifications and calculators to determine electrical and heat loading for the server, refer to the HP Enterprise Configurator website (http://h30099.www3.hp.com/configurator/).

DDR SDRAM DIMM Specifications

NOTE: Use only 256-, 512-MB, 1-GB, or 2-GB; 72-bit wide; 2.5-V; PC2700 Registered ECC DDR SDRAM. Use HP DDR SDRAM only.

Item	Description
Size	256 MB, 512 MB, 1 GB, 2 GB
Width	72 bits
Upgrade requirement	Any combination of like-paired DDR SDRAM DIMMs that provide a minimum of 512 MB

1.44-MB Diskette Drive Specifications

Item	Description
Dimensions	
Height	12.7 mm (0.5 in)
Width	96 mm (3.8 in)
Depth	130 mm (5.1 in)
LEDs (front panel)	Green = On
Read/write capacity per diskette	
High density	1.44 MB
Low density	720 KB
Drives supported	1
Drive height	One-third height
Drive rotation	300 rpm
Transfer rate	
High	500 Kb/s
Low	250 Kb/s
Bytes/sector	512
Sectors per track (high/low)	18/9
Tracks per side (high/low)	80/80
Access times	
Track-to-track (high/low)	3 ms/6 ms
Average (high/low)	169 ms/94 ms
Setting time	15 ms
Latency average	100 ms
Cylinders (high/low)	80/80
Read/write heads	2

CD-ROM Drive Specifications

Item	Description
Applicable disk	CD-ROM (modes 1 and 2); mixed mode (audio and data combined); CD-DA; Photo CD (single/multiple-session), CD-XA ready; CDi ready
Capacity	550 MB (mode 1, 12 cm)
	640 MB (mode 2, 12 cm)
Block size	2368, 2352 bytes (mode 0)
	2352, 2340, 2336, 2048 bytes (mode 1)
	2352, 2340, 2336, 2048 bytes (mode 2)
Dimensions	
Height	12.7 mm (0.50 in)
Depth	132.08 mm (5.20 in)
Width	132.08 mm (5.20 in)
Weight	0.34 kg (0.75 lb)
Data transfer rate	
Sustained	150 KB/s (sustained 1X), 1500/3600 KB/s (10X to 24X)
Burst	16.6 MB/s
Access times (typical)	
Full stroke	300 ms
Random	140 ms
Diameter	12 cm, 8 cm (4.70 in, 3.15 in)
Thickness	1.2 mm (0.05 in)
Track pitch	1.6 µm (6.3×10^{-7} in)
Cache/buffer	128 KB
Startup time	< 10 s
Stop time	< 5 s (single); < 30 s (multisession)
Laser parameters	
Type	Semiconductor laser GaAs

Item	Description
Wave length	700 ± 25 nm
Divergence angle	53.5° ± 1.5°
Output power	0.14 mW
Operating conditions	
Temperature	5°C to 45°C (41°F to 118°F)
Humidity	5% to 90%

Ultra320 SCSI Hard Drive Specifications

Item	36.4-GB Ultra320 SCSI Drive	72.8-GB Ultra320 SCSI Drive	72.8-GB Ultra320 SCSI Drive	146.8-GB Ultra320 SCSI Drive
Capacity	36,419.6 MB	72,837.2 MB	72,837.2 MB	146,815.74 MB
Height	1.0 in (One-third height)	1.0 in (One-third height)	1.0 in (One-third height)	One-third, 1.0 in
Width	4.0 in	4.0 in	4.0 in	4.0 in
Interface	Ultra320 SCSI	Ultra320 SCSI	Ultra320 SCSI	Ultra320SCSI
Transfer rate	320 MB/sec	320 MB/sec	320 MB/sec	320 MB/sec
Rotational speed	15,000 rpm	10,000 rpm	15,000 rpm	10,000 rpm
Bytes per sector	512	512	512	512
Logical blocks	71,132,000	142,264,000	142,264,000	286,749,488
Operating temperature	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)	10°C to 35°C (50°F to 95°F)

Serial ATA Hard Drive Specifications

Item	80-GB SATA Drive	160-GB SATA Drive	250-GB SATA Drive
Capacity	80,000 MB	160,000 MB	250,000 MB

Item	80-GB SATA Drive	160-GB SATA Drive	250-GB SATA Drive
Height	1.028 in	1.028 in	1.028 in
Width	4.0 in	4.0 in	4.0 in
Interface	Serial ATA	Serial ATA	Serial ATA
Transfer rate	1.5 GB/s	1.5 GB/s	1.5 GB/s
Rotational speed	7,200 rpm	7,200 rpm	7,200 rpm
Bytes per sector	512	512	512
Logical blocks	156,301,488	312,581,808	488,397,168
Operating temperature	5°C to 55°C (41°F to 131°F)	5°C to 55°C (41°F to 131°F)	5°C to 55°C (41°F to 131°F)

Acronyms and Abbreviations

ABEND

abnormal end

ACU

Array Configuration Utility

ASR

Automatic Server Recovery

BBWC

battery-backed write cache

DDR

double data rate

DU

driver update

EFS

Extended Feature Supplement

IEC

International Electrotechnical Commission

iLO

Integrated Lights-Out

IML

Integrated Management Log

IPL

initial program load

IRQ

interrupt request

MPS

multi-processor specification

NEMA

National Electrical Manufacturers Association

NFPA

National Fire Protection Association

NIC

network interface controller

NVRAM

non-volatile memory

ORCA

Option ROM Configuration for Arrays

PCI Express

peripheral component interconnect express

PCI-X

peripheral component interconnect extended

PDU

power distribution unit

POST

Power-On Self-Test

PPM

Processor Power Module

PSP

ProLiant Support Pack

PXE

preboot eXecution environment

RBSU

ROM-Based Setup Utility

RILOE II

Remote Insight Lights-Out Edition II

SATA

serial advanced technology attachment

SCSI

small computer system interface

SDRAM

synchronous dynamic RAM

SIM

Systems Insight Manager

SIMM

single inline memory module

SPM

system power module

SSD

support software diskette

TMRA

recommended ambient operating temperature

UID

unit identification

USB

universal serial bus

VCA

version control agent

VHDCI

very high density cable interconnect

WOL

Wake-on LAN

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